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10/589,243

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EXAMINER

ZHANG, YUANDA

ART UNIT

PAPER NUMBER

2828

MAIL DATE

DELIVERY MODE

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |                                      |                                   |  |
|------------------------------|--------------------------------------|-----------------------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/589,243 | <b>Applicant(s)</b><br>ITO ET AL. |  |
|                              | <b>Examiner</b><br>YUANDA ZHANG      | <b>Art Unit</b><br>2828           |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 26 April 2011.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 April 2011 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Response to Amendment***

1. The Examiner acknowledges and accepts the amendment filed on 04/26/11.  
  
No claim is amended; and  
  
Claims 1-9 are currently pending.

### ***Drawings***

2. Objections to the drawings have been withdrawn and newly submitted drawings have been accepted.

### ***Response to Arguments***

3. Applicant's arguments, see 2<sup>nd</sup> Paragraph, p. 4, Remarks, filed 04/26/11, with respect to 35 U.S.C. 102(a) have been fully considered and are persuasive. The rejections of claims 1-4 and 6-9 being unpatentable over Kagotani et al. have been withdrawn. However, upon a further consideration, the arguments are moot in view of a new ground of rejection.
4. Applicant's arguments, see 5<sup>th</sup> Paragraph, p. 4, Remarks, filed 04/26/11, with respect to 35 U.S.C. 102(b) have been fully considered and are persuasive. The rejections of claims 6-8 being unpatentable over Masumoto'1978 have been withdrawn. However, upon a further consideration, the arguments are moot in view of a new ground of rejection.
5. Applicant's arguments with respect to 35 U.S.C. 103(a) being unpatentable over Masumoto'1993 in view of Masumoto'1978 have been fully considered but they are not persuasive.

6. *Regarding claim 1, the Applicants have argued that "application of Feature B to Feature A is not disclosed by the combined teachings of Masumoto ' 1978 and Masumoto ' 1993 .... Specifically, the biexcitons are directly generated in the quantum dots by the two-photon resonant excitation, without the intermediary of the exciton state, and this allows easy formation of completely inverted population between biexciton and exciton states (see paragraphs [0020], [0049], [0109], etc. of the specification as originally filed)." (1<sup>st</sup> and 2<sup>nd</sup> Paragraph, p. 6, Remarks)*

7. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the biexcitons are directly generated in the quantum dots by the two-photon resonant excitation, without the intermediary of the exciton state.) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Therefore, the arguments are moot.

***Claim Rejections - 35 USC § 102***

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Art Unit: 2828

9. Claims 1 and 5-7 are rejected under 35 U.S.C. 102(e) as being anticipated by Shields et al. (US PG Pub 2003/0218143 A1).

10. Regarding claim 1, Shields discloses a laser device (fig. 8) for causing lasing by using a semiconductor quantum dot (37, fig. 8, [0172]), comprising a laser member (fig. 8) in which said semiconductor quantum dot is formed; a resonating section (formed by a lower Bragg mirror 51 and an upper Bragg mirror 53, fig. 8, [0169] and [0175]) for resonating light generated in the laser member; and an excitation light source section (exciton creation means, see abstract and [0214]) for irradiating the laser member with excitation light whose energy corresponds to two-photon resonant excitation, so as to form a biexciton state in the semiconductor quantum dot by the two-photon resonant excitation.

11. Regarding claim 5, Shields discloses said laser member includes the semiconductor quantum dot (fig. 8) and a base material (35, fig. 8, [0170]) retaining the semiconductor quantum dot; said semiconductor quantum dot is made of InAs or InGaSb ([0172]); and said base material is made of GaAs ([0170]).

12. Regarding claim 6, Shields discloses a lasing method (fig. 8) which causes lasing by using a semiconductor quantum dot (37, fig. 8, [0172]), comprising the step of: forming a biexciton state in the semiconductor quantum dot by two-photon resonant excitation (via exciton creation means, see abstract and [0214]), so as to cause lasing by inducing light emission from the semiconductor quantum dot.

13. Regarding claim 7, Shields discloses said biexciton state in the semiconductor quantum dot is formed by irradiating the semiconductor quantum dot with excitation light

Art Unit: 2828

whose energy corresponds to said two-photon resonant excitation (see abstract and [0214]).

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

16. Claims 1-4, 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masumoto et al. ("Biexciton lasing in CuCl quantum dots", Appl. Phys. Lett. 62(3), Jan. 1993, pp. 225-227) (IDS filed on 11/13/06) (Masumoto'1993) in view of Masumoto et al.'1978.

17. Regarding claim 1, Masumoto'1993 discloses a laser device (fig. 1) for causing lasing by using a semiconductor quantum dot, comprising a laser member (CuCl quantum dots embedded in a NaCl crystal, fig. 1) in which said semiconductor quantum dot is formed; a resonating section (formed by dielectric mirrors) for resonating light generated in the laser member; and an excitation light source section (a nitrogen laser

Art Unit: 2828

excitation, fig. 1) for irradiating the laser member with excitation light (see abstract).

Masumoto'1993 does not disclose the excitation light source section for irradiating the laser member with excitation light whose energy corresponds to two-photon resonant excitation, so as to form a biexciton state in the semiconductor quantum dot by the two-photon resonant excitation. Masumoto'1978 discloses two-photon resonance excitation of biexcitons in CuCl by picoseconds pulses (paragraph under 3p-BG-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser device of Masumoto'1993 with the two-photon resonant excitation as taught by Masumoto'1978 in order to obtain an improved S/N ratio (paragraph under 3p-BG-9 of Masumoto'1978).

18. Regarding claim 2, Masumoto'1993, when modified by Masumoto'1978, discloses a continuous irradiation period in which said excitation light source section continuously irradiates the laser member with excitation light is of the order of picoseconds (paragraph under 3p-BG-9 of Masumoto'1978).

19. Regarding claim 3, Masumoto'1993 and Masumoto'1978 have disclosed the laser device outlined in the rejection to claim 1 above. Masumoto'1993 and Masumoto'1978 do not explicitly disclose a continuous irradiation period in which said excitation light source section continuously irradiates the laser member with excitation light is of the order of femtoseconds. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser device of Masumoto'1993 and Masumoto'1978 with excitation light of the order of femtoseconds in order to obtain a desired output power.

Art Unit: 2828

20. Regarding claim 4, Masumoto'1993 discloses said laser member includes the semiconductor quantum dot and a base material retaining the semiconductor quantum dot; said semiconductor quantum dot is made of any one of CuCl, CuBr, CdSe, CdS (CuCl quantum dots, fig. 1); and said base material is made of glass or alkali halide crystal (NaCl crystal, see abstract).

21. Regarding claim 6, Masumoto'1993 discloses a lasing method (fig. 1) which causes lasing by using a semiconductor quantum dot (CuCl quantum dots embedded in a NaCl crystal, fig. 1), comprising the step of: forming a biexciton state in the semiconductor quantum dot by an excitation source (a nitrogen laser excitation, fig. 1), so as to cause lasing by inducing light emission from the semiconductor quantum dot (see abstract). Masumoto'1993 does not disclose two-photon resonant excitation. Masumoto'1978 discloses two-photon resonance excitation of biexcitons in CuCl by picoseconds pulses (paragraph under 3p-BG-9). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser device of Masumoto'1993 with the two-photon resonant excitation as taught by Masumoto'1978 in order to obtain an improved S/N ratio (paragraph under 3p-BG-9 of Masumoto'1978).

22. Regarding claim 7, Masumoto'1993, when modified by Matsumoto'1978, discloses said biexciton state in the semiconductor quantum dot is formed by irradiating the semiconductor quantum dot with excitation light whose energy corresponds to said two-photon resonant excitation (paragraph under 3p-BG-9 of Matsumoto'1978).



Art Unit: 2828

23. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Masumoto et al.'1993 and Masumoto et al.'1978 as applied to claim 1 above, and further in view of Ledentsov N. N. et al. ("Optical properties of heterostructures with InGaAs-GaAs quantum clusters", Semiconductors 28(8), Aug 1994, pp. 832-834) (IDS filed on 11/13/06).

24. Regarding claim 5, Masumoto'1993 and Masumoto'1978 have disclosed the laser device outlined in the rejection to claim 1 above. Masumoto'1993 further discloses said laser member includes the semiconductor quantum dot (CuCl quantum dots) and a base material (NaCl crystal) retaining the semiconductor quantum dot (see abstract of Masumoto'1993). Masumoto'1993 and Masumoto'1978 do not disclose said semiconductor quantum dot is made of InAs or InGaSb; and said base material is made of GaAs. Ledentsov discloses a lasing material with InGaAs-GaAs quantum clusters comprising semiconductor quantum dot made of InAs, and base material made of GaAs (see abstract). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser device of Masumoto'1993 and Masumoto'1978 with the InAs quantum dot and the GaAs base material as taught by Ledentsov in order to obtain various wavelength outputs.

25. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Masumoto et al.'1978.

26. Regarding claims 8 and 9, Masumoto'1978 has disclosed the lasing method outlined in the rejection to claim 7 above. Masumoto'1978 does not explicitly disclose a

Art Unit: 2828

continuous irradiation period of said excitation light is of the order of femtoseconds. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the lasing method of Masumoto'1978 with excitation light of the order of femtoseconds in order to obtain a desired output power.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUANDA ZHANG whose telephone number is (571)270-1439. The examiner can normally be reached on Monday-Friday, 9:00am-5:00pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Stultz can be reached on 571-272-2339. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Application/Control Number: 10/589,243  
Art Unit: 2828

Page 10

/Yuanda Zhang/  
Primary Examiner, Art Unit 2828